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STATISTICAL BULLETIN
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TUBERCULOSIS DEATHRATE AMONG INDUSTRIAL POPULATIONS OF AMERICAN AND CANADIAN CITIES

The industrial population of the cities of the Western Provinces of Canada, enjoyed, in 1925, a lower deathrate from tuberculosis than did urban wage-earners in any other region of the United States or Canada. As we noted in the July BULLETIN, this same region also had the lowest deathrate for all causes combined, in the two countries. Tuberculosis, although no longer the leading cause of death, is still an important factor in determining the general deathrate of any community.

In the cities of the Eastern Provinces of Canada, on the other hand, the high tuberculosis deathrate is in marked contrast to the above and exceeds, in fact, that for any region of the two countries with the exception of the East South Central States. Nova Scotia cities, with a rate of 150.5 per 100,000, registered higher tuberculosis mortality than that of any state or province with the exception of Colorado. The cities of the Province of Quebec, (121.8) had the third highest figure in both countries. That the tuberculosis deathrate among the Canadian urban wage-earners exceeded that in the United States by 19 per cent. is due entirely to the excessively high mortality in Nova Scotia, Quebec and New Brunswick.

Next to the Western Provinces of Canada, the lowest tuberculosis deathrate was registered in the industrial population of the cities in the West North Central States. In this group, Nebraska had the third best rank among the states and provinces.

The third best record was made in the East North Central group and the fourth best in the Mountain States. If, however, we were to eliminate the record of Colorado from the latter group, this region would have by far the best record in either country. Of the other three states, Utah has a much lower rate for this disease among its urban industrial population than any state or province, while Idaho

and Montana rank fourth and fifth, respectively. The enormous tuberculosis deathrate in the Colorado cities (219.5 per 100,000) emphasizes the fact that the very communities where climatic conditions tend most to prolong the lives of those afflicted with tuberculosis suffer the highest deathrate from it. Among the thousands who go, each year, to Colorado seeking to save or extend life, there must needs be a heavy toll of death. In a study of 23,608 deaths from tuberculosis in Colorado during the period 1908-1920, it was shown that for every case that "developed" within the state, five cases were contracted outside.*

The New England States rank fifth with a deathrate slightly below the average for the United States.

In the remaining groups of states, the urban industrial populations registered tuberculosis deathrates in excess of the average. The Middle States rank sixth. Much more favorable conditions prevail in Pennsylvania and New Jersey cities than in those of New York. The Pacific Coast States rank seventh in order, followed very closely by the South Atlantic group. The unfavorable showing for the Coast is due entirely to the high rate which prevails in California. Like Colorado, this state suffers from a high non-resident deathrate from tuberculosis. In the South Atlantic States very high tuberculosis mortality prevails in the wage-earning populations of Maryland and Virginia with above-average rates, also, in North Carolina and Georgia. In the remaining three regions—namely, the West South Central, the Eastern Provinces of Canada and the East South Central group—the mortality from this disease is very high. The East South Central group recorded the highest tuberculosis deathrate among its urban industrial wage-earners and their families, of any region in either country.

The rates quoted in the foregoing text relate to white persons only. Tuberculosis mortality among the more than 2,000,000 colored Industrial policyholders of the Metropolitan, in 1925, was approximately three times that for the whites. While the Company has only 7,000 colored policyholders in Canada, it is rather significant that the deathrate among them was only 138.8 per 100,000, as compared with 227.0 among colored persons exposed to risk in the United States.

The table on page 3 presents the deathrate for white and colored policyholders, respectively, by geographic division, state and province.

*SEWALL, HENRY, *American Review of Tuberculosis*, August, 1923.

Deathrates per 100,000 Persons Exposed. Tuberculosis—All Forms. By Geographic Division, State and Province. Metropolitan Life Insurance Company, Industrial Department, 1925 (Excluding Infants under One Year of Age)

Geographic Division	Rates per 100,000	
	White	Colored
Total Company	79.2	226.7
United States	78.0	227.0
New England	73.6	185.7
Maine	59.0	*
New Hampshire	58.3	†
Vermont	55.9	*
Massachusetts	80.0	235.4
Rhode Island	79.3	*
Connecticut	65.6	123.4
Middle Atlantic	82.7	215.0
New York	91.2	243.3
New Jersey	76.4	213.0
Pennsylvania	72.1	190.9
East North Central	64.4	225.5
Ohio	66.4	237.0
Indiana	78.8	181.9
Illinois	61.3	230.1
Michigan	59.1	238.4
Wisconsin	61.9	288.1
West North Central	61.8	228.2
Minnesota	45.5	182.4
Iowa	39.3	161.2
Missouri	74.9	230.6
Nebraska	23.5	309.3
Kansas	59.0	237.4
South Atlantic	91.0	231.2
Delaware	60.8	172.4
Maryland	120.2	254.9
District of Columbia	70.9	213.4
Virginia	113.4	240.4
West Virginia	67.0	252.2
North Carolina	87.8	251.5
South Carolina	63.4	231.9
South Atlantic (*Cont.*)		
Georgia	81.4	213.9
Florida	52.5	221.1
East South Central	102.8	251.5
Kentucky	108.0	211.9
Tennessee	114.0	270.4
Alabama	81.1	211.5
Mississippi	59.8	*
West South Central	94.3	228.6
Arkansas	78.6	326.7
Louisiana	111.6	192.4
Oklahoma	56.6	214.0
Mountain	65.1	272.2
Montana	36.3	*
Idaho	25.9	†
Colorado	219.5	306.8
Utah	4.6	*
Pacific	90.8	227.9
Washington	52.7	284.9
Oregon	62.1	*
California	104.9	226.0
Canada	92.4	138.8
Eastern Provinces	99.4	*
Nova Scotia	150.5	*
New Brunswick	101.4	*
Quebec	121.8	*
Ontario	58.0	*
Western Provinces	43.0	*
Manitoba	52.8	*
Saskatchewan	14.8	*
Alberta	44.2	*
British Columbia	46.3	*

*Deathrate not calculated on account of small number of colored policyholders.
†No Deaths.

PARALLEL COURSE OF DEATHRATES FROM FOUR DISEASES OF CHILDHOOD

A study of the fluctuating course of the deathrates from measles, whooping cough, diphtheria and scarlet fever in the period 1900 to

1923, in the Registration States of the United States has revealed unmistakable evidence of two interesting phenomena, namely, (1) periodicity, peaks occurring with much regularity at intervals of about seven years; (2) parallelism in the general course of the four diseases under discussion.

The periodicity was common to all four diseases studied, the peaks falling at about the same years, namely, about 1900, 1907, 1914, 1921. Three of the diseases—measles, whooping cough and diphtheria—showed, in addition to the full seven-year period, also a distinct half-period of three or four years. Scarlet fever in this respect formed an exception, the half-period being either absent or at any rate not clearly discernible.

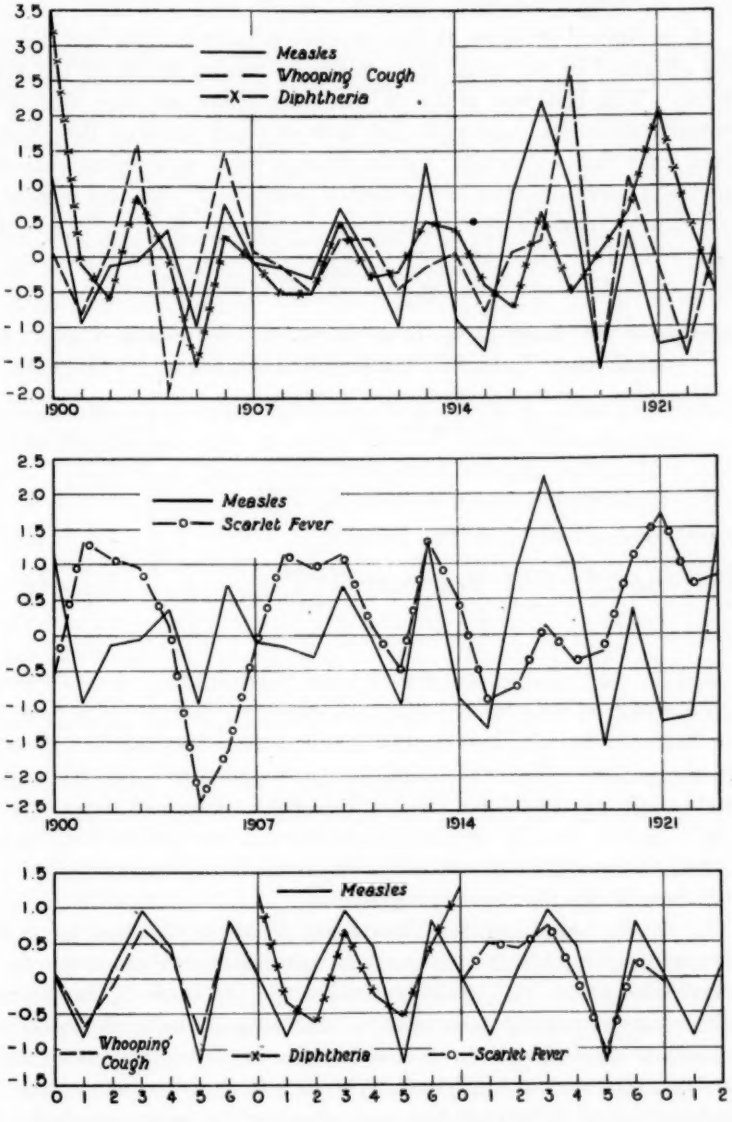
These relations are brought out with clarity in the graph. This requires, however, a word of explanation. It should be remembered that the general course of the deathrates of these children's diseases is the compound of two separate influences. On the one hand, there has been a general decline from the juvenile causes; in fact, a large part of our gain in expectation of life arises from this decline. But, on the other hand, superimposed upon this general downward trend, comes a series of waves of more or less epidemic character. It is these waves which more particularly interest us here. In preparation for this graph, trend lines were first fitted to the time series of the several diseases. A new time series was then constructed, using the deviations from the trend line in place of the deathrates themselves; and finally, these deviations were expressed as per cents. of their standard deviation, in order to bring the figures for the four diseases down to a common basis to facilitate comparison.

The upper panel in the chart on page 5 shows the curve of deviations from the trend (expressed in per cents. of the standard deviation) for measles, whooping cough and diphtheria. The general parallelism, as well as the seven-year periodicity and the half-periods, immediately strike the eye. In the second panel, scarlet fever has been singled out for comparison with measles. Here again the seven-year period is apparent, but, as already stated, the half-periods of measles have no obvious counterpart in scarlet fever.

In the third panel of the graph an "average" period, obtained by telescoping three successive periods (1900-1906, 1907-1913, 1914-1920) into one, adding corresponding terms and dividing by three, is shown. The scale at the bottom of the lower panel reads from zero to six, corresponding to the seven years of the "average" period. The corresponding dates are as follows: zero is the average of the

PARALLEL STUDY OF DEATHRATES

FOR FOUR DISEASES OF CHILDHOOD UNITED STATES REGISTRATION AREA, 1900-1923



years 1900, 1907, 1914; the numeral 1 corresponds to 1901, 1908, 1915; 2 corresponds to 1902, 1910, 1916, and so forth. As basis of comparison in each case, the measles curve is shown: first, together with that for whooping cough (here the two curves are almost identical); second, together with the curve for diphtheria, and, third, with that for scarlet fever.

A numerical measure of the correlation between the four diseases was obtained in the usual way, with the results shown in the table below. The last few years of the time series are not altogether representative, for deathrates are now so much reduced that departures from the "expected," value, though small in absolute amount, may be a large fraction of the actual deathrate. For this reason, in the computation of the correlation coefficient, in most cases the series 1900-1920 only was used. In one instance (diphtheria-whooping cough) the series was cut short at 1917, as shown.

Correlation in Deathrates from Measles, Whooping Cough and Diphtheria. United States Registration States, 1900-1923

DISEASES CORRELATED	COEFFICIENT OF CORRELATION, AND PROBABLE ERROR
Measles correlated with whooping cough 1900–1923	.469 ± .107
Measles correlated with diphtheria 1900–1920	.399 ± .124
Diphtheria correlated with whooping cough 1900–1923	.052 ± .137
1900–1917	.242 ± .150

It will be seen that there is a definite, significant and moderately high correlation between measles and whooping cough. The correlation between measles and diphtheria is a little less marked though still significant. The correlation between diphtheria and whooping cough might be considered doubtful on the evidence of these figures alone. But it may be questioned whether a correlation coefficient, in such cases as this, is an adequate measure of the parallelism in the course of the phenomena considered.

As to the causes of the periodicity in these diseases, we have only surmises to offer. It has been customary to associate such periodicities either with some feature in the life cycle of the pathogenic organism causing the disease, or with some periodic phenomenon in weather conditions. In this connection it is of interest to note that a seven and a half-year cycle in sunspot frequency, and a correlated cycle in rainfall, has been observed by meteorologists. A

recent discussion of this topic will be found in the *Monthly Weather Review*, volume 54, February, 1926, page 49; also in the *Journal of the Royal Statistical Society*, 1926, page 52.

SMALLPOX IN AMERICAN STATES AND CANADIAN PROVINCES, FIRST SIX MONTHS OF 1926

Reports from 41 states and the District of Columbia and from eight Canadian provinces show that smallpox during the first half of 1926 was less prevalent than in the same period of last year. In the United States it was also, by and large, of a less virulent type, the case-fatality rate dropping from 2.2 deaths per 100 cases during the first half of 1925, to 1.6 in 1926. In Canada, although the number of case reports declined from 916 to 739, the deaths increased from 10 to 13 and the case-fatality rate from 1.1 to 1.8. In the 42 American communities, the case-fatality rate was higher, however, than for the first half of 1924. The following table shows the comparative record for the first six months of these three years.

Smallpox Cases, Deaths and Case-Fatality Rates, First Six Months of Each Year, 1924 to 1926. For 41 United States States, District of Columbia and Eight Canadian Provinces

AREA	1926			1925			1924		
	Cases	Deaths	Deaths per 100 Cases	Cases	Deaths	Deaths per 100 Cases	Cases	Deaths	Deaths per 100 Cases
United States and Canada	21,300	334	1.6	26,789	577	2.2	35,821	428	1.2
United States (41 States and D. C.)	20,561	321	1.6	25,873	567	2.2	33,923	373	1.1
8 Canadian Provinces	739	13	1.8	916	10	1.1	1,898	55	2.9

The facts for states and provinces in which either the number of deaths from smallpox was above-average, or the case-fatality rate outstandingly high, are presented in the table on page 8.

In Florida, from which the largest number of cases was reported, the disease, fortunately, was of a mild type and the mortality was low; and this also applies to Indiana and Oregon, and to other states where there were many cases of smallpox. In California, which ranked next to Florida in actual prevalence of the disease, smallpox prevailed in an extremely virulent form with the result

that one person died among every ten who were sick with the disease, the actual death toll being 231 lives.

It is only by the sheerest good fortune that just as high, or a higher case-fatality rate did not prevail in other states where thousands of persons contracted the disease. In Arizona there were only 16 smallpox cases, but there were six deaths. If this degree of

Selected States and Canadian Provinces Showing a High Fatality Rate or Above-Average Prevalence of Smallpox During the First Six Months of 1926

Area	Cases	Deaths	Deaths per 100 Cases
United States			
Alabama	939	4	.43
Arizona	16	6	37.50
California	2,432	231	9.50
Colorado	31	1	3.23
Florida	2,525	6	.24
Idaho	396	1	.25
Indiana	2,354	3	.13
Kansas	315	1	.32
Kentucky	408	1	.25
Louisiana	882	8	.91
Michigan	254	2	.79
Nebraska	514	6	1.17
North Carolina	877	3	.34
North Dakota	128	7	5.47
Oregon	1,079	4	.37
Tennessee	503	3	.60
Washington	1,776	29	1.63
West Virginia	255	2	.78
Canada			
Alberta	66	2	3.03
British Columbia	62	1	1.61
Manitoba	103	7	6.80
Ontario	350	2	.57
Saskatchewan	158	1	.63

virulence had been general among the 20,561 cases of this loathsome disease reported from 42 American communities, during a six months' period, more than 7,700 lives would have been lost. This did not occur; but it is nevertheless true that at any time, with the present high ratio of unvaccinated persons in these two countries, it is entirely possible that the smallpox situation may lead to a catastrophe. Under present conditions, the populations of the two countries provide ample tinder for just such a conflagration. There is only one known—and tested—safeguard: vaccination and revaccination. Prevention of the disease by this means is a vital matter for both countries.

HEALTH RECORD OF AUGUST, 1926

The deathrate in the industrial populations of the United States and Canada, in August, declined slightly as compared with the preceding month. This reflects the usual seasonal improvement that is observed at this time of the year. Compared with August, 1925, there was an increase from a rate of 7.6 per 1,000 to 7.9.

The table on page 11 shows higher rates in August than prevailed a year ago for every cause of major numerical importance, although in no case is there a marked rise in the mortality. For August and each of the two months immediately preceding, the tuberculosis deathrate increased over last year, and the cumulative rate for tuberculous disease is now substantially the same as at this time last year. It is now possible that 1926 will break the long sequence of years which have shown year-to-year drops in the tuberculosis deathrate. Attention was directed to this possibility in the July BULLETIN. This is, after all, not so discouraging a development. The reduction in the tuberculosis rate has been marked during several decades and the time was bound to come when either a decided retardation in the velocity of the decline would be experienced, or a new low point established which could not be bettered for some years to come. Insofar as can be judged by an analysis of data available at this time, the failure to improve over last year's tuberculosis deathrate is due, entirely, to an increase among the colored policyholders. Up to the end of June, there was a drop of 2.8 per cent. from the corresponding figure of 1925 among the white industrial population of the United States and Canada.

It is now safe to say that a very considerable reduction will be shown in 1926 in the deathrate for diarrheal diseases. The season when these conditions are most prevalent has nearly passed; and for each of the three months, June, July, and August, the diarrheal deathrate declined very markedly from the figure recorded a year ago. Another favorable development is a decline in the puerperal deathrate, since 1925.

Automobile fatalities were much fewer in August and in July than during the same months of 1925. Up to the week ending September 18th, the cumulative deathrate for this cause was actually a little lower than for the corresponding period of last year. This is the most gratifying development in the fatal accident record for 1926. Comparison for the first six months of the year shows the usual increase which has been a source of worry to public safety officials for many years. The improvement, has, therefore, been in

the last two months. It is still too early to assume that the record for the year, when complete, will show a lower automobile fatality rate than did 1925. It is possible that the final quarter of 1926 may again be unfavorable. It is a fact, nevertheless, that what has happened during the late summer is an exceedingly encouraging development, and one that will be gratifying news to all who are concerned with accident control.

The general deathrate for the large cities of the United States, in August, was 10.5 per 1,000 population, which is identical with that for the same month of last year and considerably lower than for the previous month (11.5). As compared with July, more cases were reported in August of influenza, malaria, poliomyelitis, and typhoid fever, with a lower prevalence of diphtheria, measles, scarlet fever, smallpox, and whooping cough. Comparison with August of last year shows more case reports of influenza, measles, scarlet fever, smallpox, and whooping cough, with less diphtheria, poliomyelitis, and typhoid fever.

Reports from all sections of the country indicate that the severe measles epidemic of 1926 has come to an end. There was a very pronounced drop in case reports during August. Scarlet fever and diphtheria were also much less prevalent.

Smallpox cases were fewer in most of the states. During August, there was an outbreak among unvaccinated negroes in Brooklyn, N. Y.

The usual seasonal increase in the incidence of typhoid fever is being experienced. The most outstanding increases in case reports were in Alabama and Illinois. There is increased prevalence of poliomyelitis in a number of states, more particularly in Massachusetts and California. It was necessary to postpone the opening of the schools in Springfield, Mass. for a few days because of this disease.

The following table shows the mortality among Industrial policyholders for August, 1926; July, 1926; August, 1925; and for the year 1925.

METROPOLITAN LIFE INSURANCE COMPANY

Deathrates* per 100,000 for Principal Causes, Premium Paying Business in Industrial Department (Annual Basis)

MONTHS OF AUGUST, 1926; JULY, 1926, AND OF AUGUST, 1925

CAUSES OF DEATH	RATE PER 100,000 LIVES EXPOSED*			
	Aug., 1926	July, 1926	Aug., 1925	Year 1925
TOTAL—ALL CAUSES	785.8	823.1	763.4	907.5
Typhoid fever	4.8	3.1	7.1	4.6
Measles	3.1	6.6	1.4	3.3
Scarlet fever	2.0	2.6	1.8	3.5
Whooping cough	7.9	8.7	8.8	7.7
Diphtheria	5.7	5.8	5.2	10.6
Influenza	5.0	9.3	3.9	22.0
Tuberculosis (All forms)	89.0	98.1	83.4	98.1
Tuberculosis of resp'y system	75.3	84.5	71.9	85.9
Cancer	72.3	69.1	63.9	70.5
Diabetes mellitus	13.1	13.1	11.4	15.2
Cerebral hemorrhage	45.2	48.2	43.2	53.6
Organic diseases of heart	99.6	117.2	96.7	126.6
Pneumonia (All forms)	36.0	48.0	33.5	86.5
Other respiratory diseases	10.2	10.6	9.6	13.2
Diarrhea and enteritis	49.7	31.2	61.5	36.7
Bright's disease (Chronic nephritis)	58.4	61.2	57.2	69.8
Puerperal state	13.2	14.5	14.2	16.5
Suicides	6.7	6.8	5.3	6.9
Homicides	6.2	7.5	6.7	7.2
Other external causes (excluding suicides and homicides)	70.6	71.0	71.2	64.3
Traumatism by automobiles	15.6	17.3	18.8	16.6
All other causes	187.3	190.6	177.3	190.7

*All figures include infants insured under one year of age.

Correspondence on the subjects discussed in these BULLETINS may be addressed to: The Editor,

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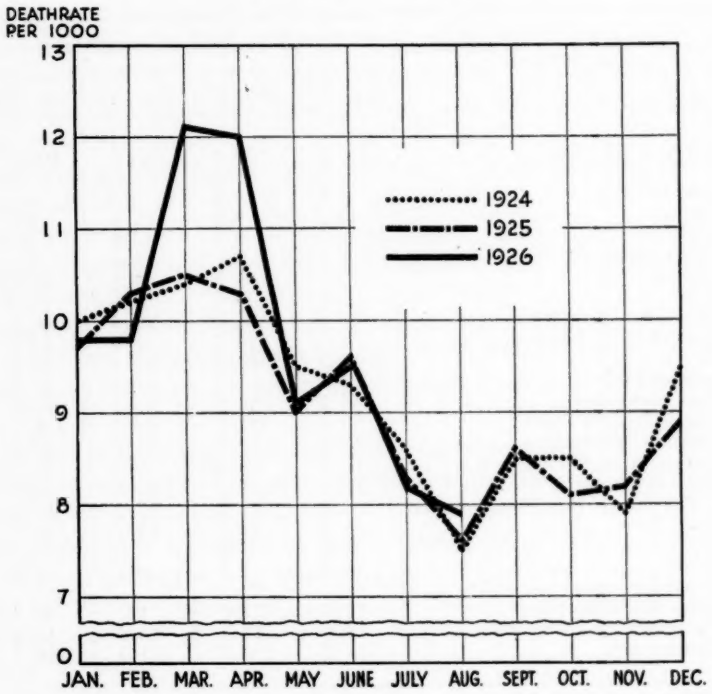
DEATHRATE PER 1000
IN SPECIFIED MONTHS OF
1924, 1925, 1926

METROPOLITAN LIFE INSURANCE COMPANY
INDUSTRIAL DEPARTMENT
(ANNUAL BASIS)



	1924	1925	1926		1924	1925	1926
JAN.	10.0	9.7	9.8	JULY	8.6	8.3	8.2
FEB.	10.2	10.3	9.8	AUG.	7.5	7.6	7.9
MAR.	10.4	10.5	12.1	SEPT.	8.5	8.6	
APR.	10.7	10.3	12.0	OCT.	8.5	8.1	
MAY	9.5	9.0	9.1	NOV.	7.9	8.2	
JUNE	9.3	9.6	9.5	DEC.	9.5	8.9	

NOTE: Figures include mortality of infants under one year of age

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